State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: FILE

Date: August 11, 2010

File: 04-SF-101-PM 8.3/9.4
04-163711
Doyle Drive Replacement, P3

From: TIMOTHY J. POKRYWKA
Chief
Office of Geotechnical Design - West
Geotechnical Services
Division of Engineering Services

Subject: CDSM/CIDH Test Scoping Document Disclaimer

The attached memo was prepared for the purposes of scoping, justifying and estimating the cost of a CDSM/CIDH demonstration project. The design of the project was changed subsequent to this memo due to the tools available to the selected contractor and actual ground conditions encountered at the site.

The Concessionaire is recommended to use all the information for reference purposes only. This information might be invalidated, wholly or partially, by changes outside of our control. No warranty, expressed or implied, or merchantability or fitness, is made or intended in connection with our work. The Concessionaire is responsible to verify them.

c: TPokrywka, MMomenzadeh, KMoghbel, OAlcantara, NTuqan, FGreguras, Daily File, Project File

TPokrywka/tp

Enc. Memo from T. Pokrywka to O. Alcantara dated April 15, 2009

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
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To: MS. OFELIA ALCANTARA
Chief
Office of Bridge Design West
Structures Design

Date: April 15, 2009

File: 04-SF-101-KP 13.4/15.1
(PM 8.3/9.4)
04-163731
Doyle Drive Replacement

From: MR. TIMOTHY J. POKRYWKA
Chief
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

Subject: Cement Deep Soil Mixing (CDSM) and Cast in Drilled Hole (CIDH) Tests

INTRODUCTION

Ground Improvement has been proposed for Main Post Tunnels and Girard Depressed area structures. The preferred method of ground improvement is the use of CDSM to improve the poor foundation soils at the above noted sites. To meet the design and construction objectives CDSM panels in grid patterns will be constructed at the tunnel site. At the Girard depressed area a combination of CDSM columns and an aerial artificial aquitard will be constructed

The prime purpose of the ground improvement is to strengthen the upper 20 to 35 ft thick poor soils which consist of loose fill, soft compressible Bay Mud, and loose to medium dense sands which will liquefy under the design seismic loading condition. The construction of the artificial aquitard is also aimed to prevent the blow out of the identified artesian ground water pressure on the proposed depressed section of the Girard area. Based on discussions with our Joint Venture geotechnical team partners, it was concluded that conducting the test for the proposed ground improvement at the Girard depressed section will also serve the objectives of the main post tunnels. A CIDH Pile demonstration test will be also performed after the construction of a block of CDSM

columns to verify the drill hole behavior and the CIDH pile integrity under the artesian pressure effect.

The test will be conducted within the fenced area in vicinity of the Girard depressed facilities (see the attached plan). Based on the nearby borehole DNB-R7, the soils encountered with depth from the ground surface consist of 35 ft of poor fill, Soft Bay Mud, and medium dense sand, underlain by dense Colma Sand extending down to about 60 ft depth. Colma sand is underlain by stiff Old Bay Clay to about 75 ft where sandstone was encountered.

The groundwater at the medium dense sand and underlying dense Colma sand is expect to be under artesian pressure generating static piezometeric level of about 2 ft above the existing grade.

The proposed test program outlined below is aimed to provide data on verification of CDSM and CIDH pile constructability issues, CDSM Unconfined Compressive Strength (UCS), as well as on other QA/QC issues. This memorandum presents technical requirements, approximate cost estimate, and risk evaluation for the CDSM and CIDH pile tests.

TEST PROCEDURE

- Construct a compact soil pad about 5 ft above the existing ground over the entire area of the test.

- Install one block of CDSM columns (7 ft by 7ft) to 37 ft depth (2 ft into dense Colma), The UCS of CDSM shall be Minimum 150 psi (1 MPa) after 14 days. This has to be verified by coring and testing through the constructed column/panel.

- Drill a 5 ft diameter hole (shaft) through the block of CDSM column to depth of 55 ft with use of slurry.

- Observe the stability of the drilled hole periodically for a minimum of 24 hrs period.

- If the hole is stable, proceed with construction of the drilled shaft in accordance with Caltrans Special Provisions and incorporating PVC inspection pipes for GGL

(Gamma-Gamma Logging). After completion of CIDH perform integrity testing for the CIDH pile by GGL.

- If there is substantial caving, depending on its occurrence with time after the drilling, install another block of CDSM columns. This time, drill through the column using a full depth temporary casing and use of slurry as well for balancing the artesian pressure. Provide PVC pipes for performance testing. Continue with CIDH pile construction and extract the casing in accordance with the Caltrans special provisions.

COST

Below is the estimated cost breakdown of the CDSM and CIDH Pile tests program:

• Mob/Demob of CDSM equipment	$200,000
• Construct two blocks of CDSM columns	$75,000
• Construct two CIDH piles	$75,000
• QA/QC Field Work and Laboratory testing	$50,000
• Field Observation and Report Preparation	$25,000
TOTAL	**$425,000**

A total cost estimate of $450,000 should be considered, to also capture unexpected costs.

RISK ASSESSMENT

The CDSM and CIDH tests will identify potential risk associated with the following factors:

1) CDSM application under artesian groundwater pressure,
2) CDSM strength that can be achieved under site specific condition,
3) Amount of the soil-cement spoils generated from the ground improvement operation
4) Impact of artesian pressure on drilling holes for the shaft/CIDH piles,
5) Stability of the drill hole in Colma formation and verifying the need for full depth temporary casing,
6) Ground vibration due to the CDSM operation.

The impact of above factors on Time, Cost, Scope and Quality of the CDSM and CIDH piles are variables. Using the Doyle Drive Replacement Project Risk Management Plan,

the risk probability ranking is estimated to range from 20 to 40 percent with an average of 30 percent. The impact matrices for time (potential construction delays) would be medium and for cost increase (change claims for additional cement, spoil disposal, etc.) would be medium to low high. The estimated cost increase impact would be in the range $1,000,000 to $3,000,000. Quality is not included in the risk assessment since quality standards will not be compromised.

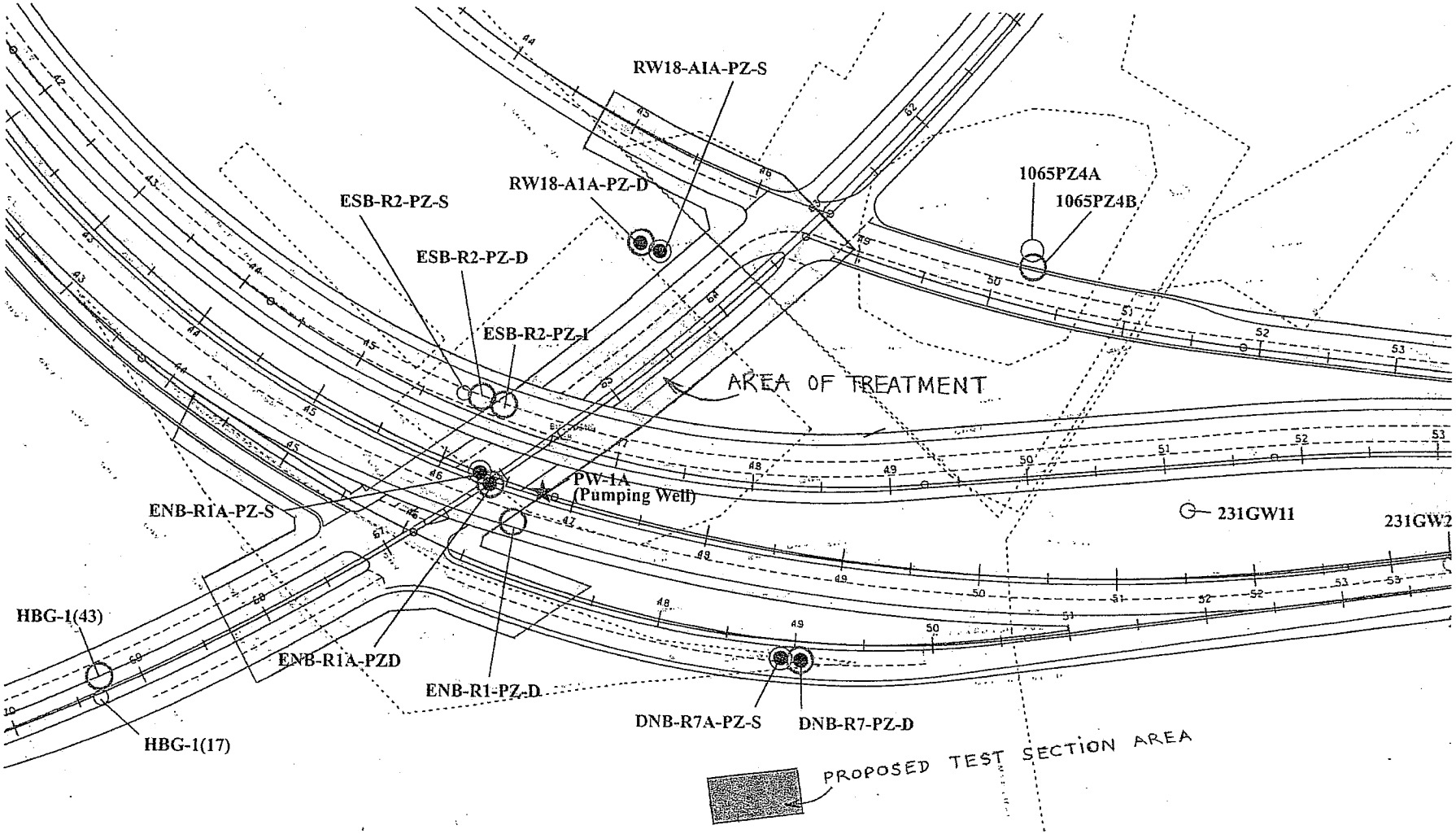
Should you have any questions or comments, please call Tim Pokrywka at (510) 286-4840.

Attachments: 1.) Figure 1 Area of Treatment Location and Proposed Test Section Area.

c: TPokrywka, MMomenzadeh, TNguyen, Frank Greguras (Arup PBJV), Terrence Carroll (Arup PBJV), John Karn (JV), Nidal Tuqan, Keyhan Moghbel, Reto Schaerli (DES-PPRM), Daily File, Route File, Translab File

MMomezandeh/mm

Figure 1. Locations of Treatment Area and Proposed Test Section Area



Note: Existing site features are shown in gray.
Proposed project roadways are shown in black.

Doyle Drive Replacement Project
San Francisco, California

Basemap: ARUP PB Joint Venture, and San Francisco Transportation Authority.

Y0239-04.A1.01179.Fig1 1-14-09

★ Pumping Well

○ Pumping Test Observation Well (Deep)

○ Pumping Test Observation Well (Shallow and Intermediate)

● Slug Test Well Location